

Cash for wetlands:

Can the use of market-based instruments improve wetland restoration outcomes in Alberta?

Intern-American Institute for Global Change Professional Development Seminar
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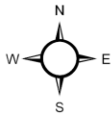
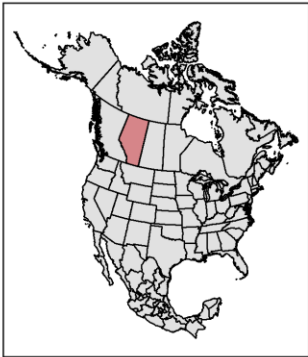
In Collaboration with:

Peter Boxall, Professor, University of Alberta

Irena Creed, Professor, Western University

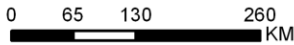


Alberta, Canada



Natural Region

-  Boreal
-  Canadian Shield
-  Foothills
-  Grassland
-  Parkland
-  Rocky Mountain



Population: 4.1 million
Area: 661,848 km²









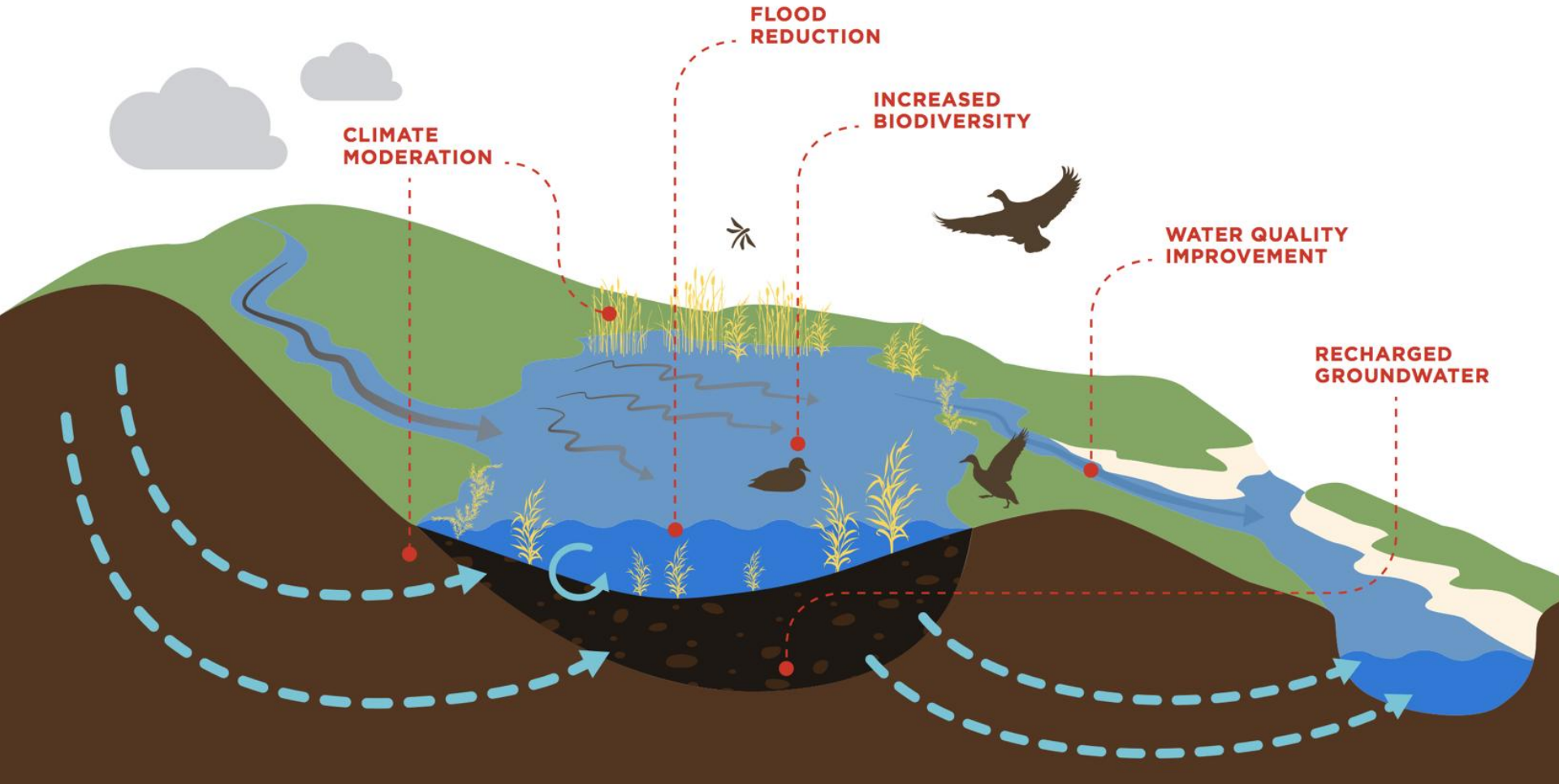






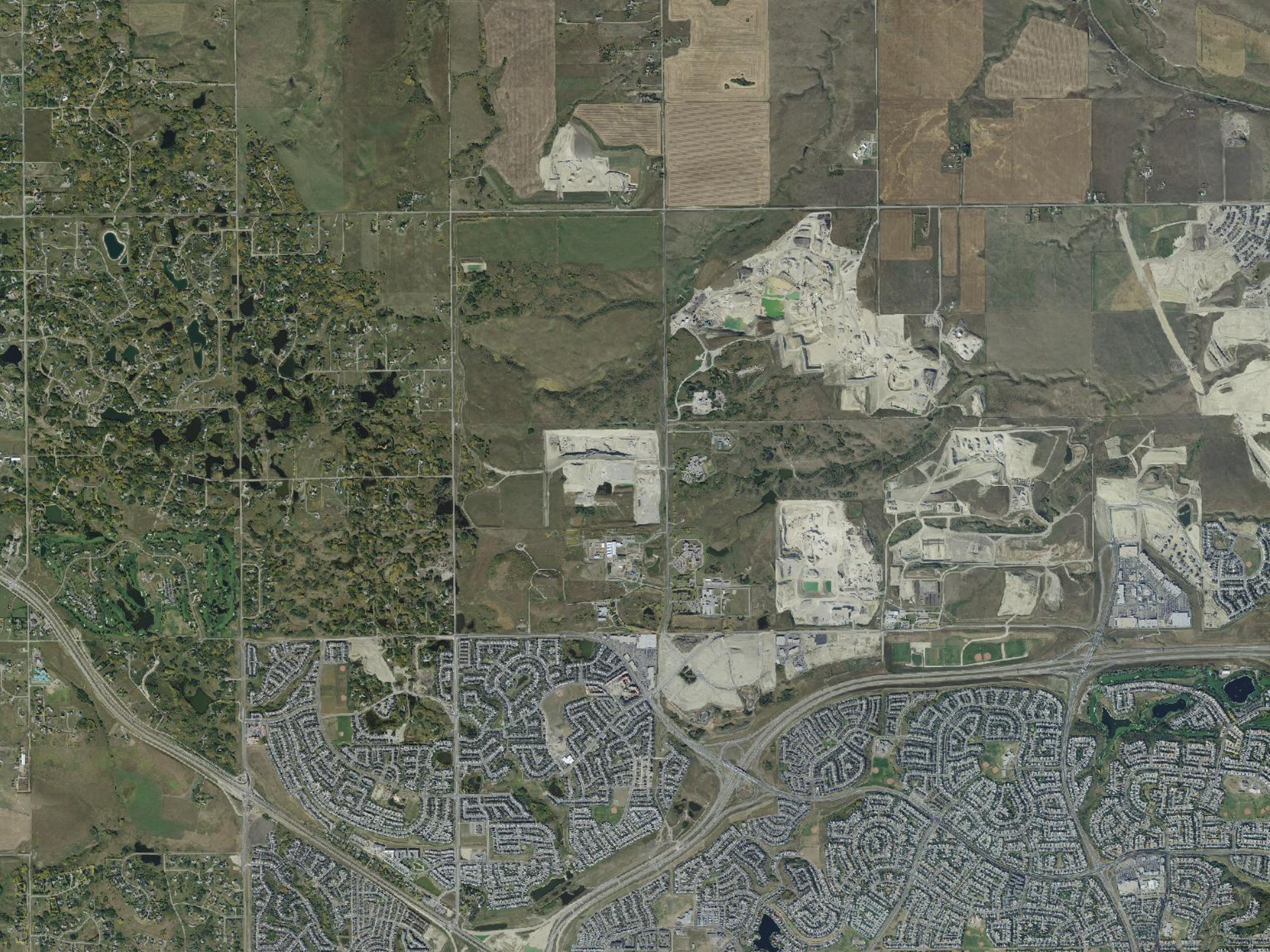


Wetlands & Ecosystem Services







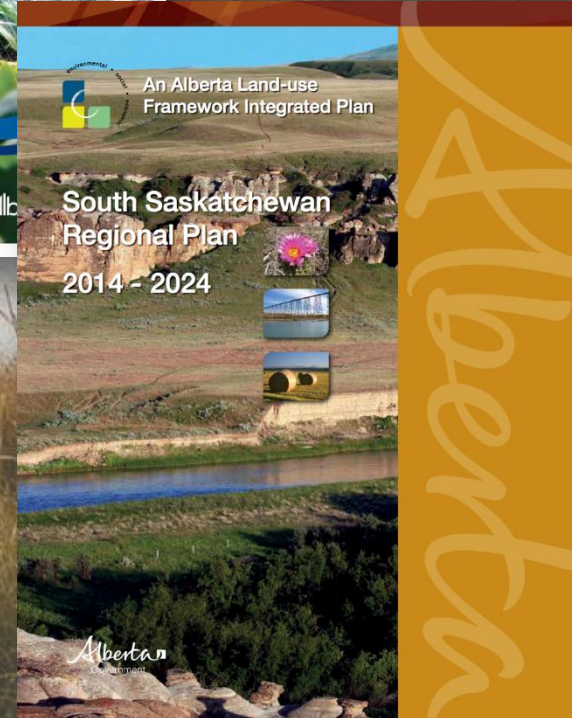
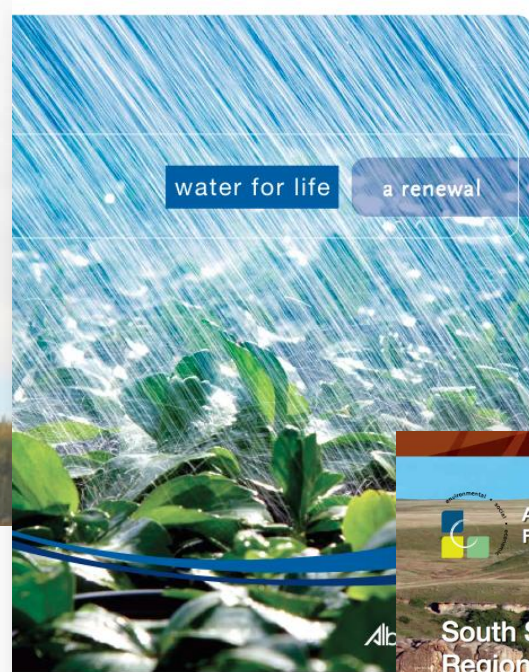








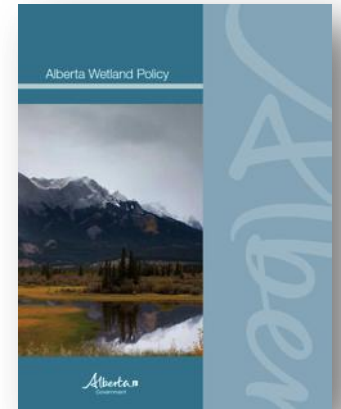
Alberta's Environmental & Water Policy



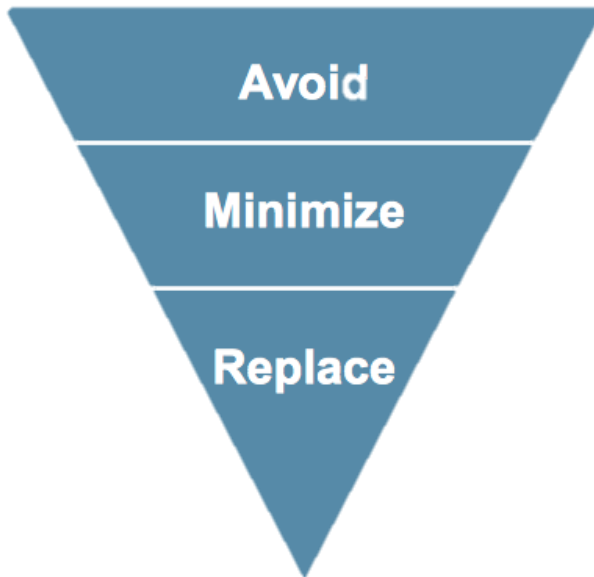
Alberta Wetland Policy (2013)

Policy Goal:

To conserve, restore, protect, and manage Alberta's wetlands to sustain the benefits they provide to the environment, society, and economy.



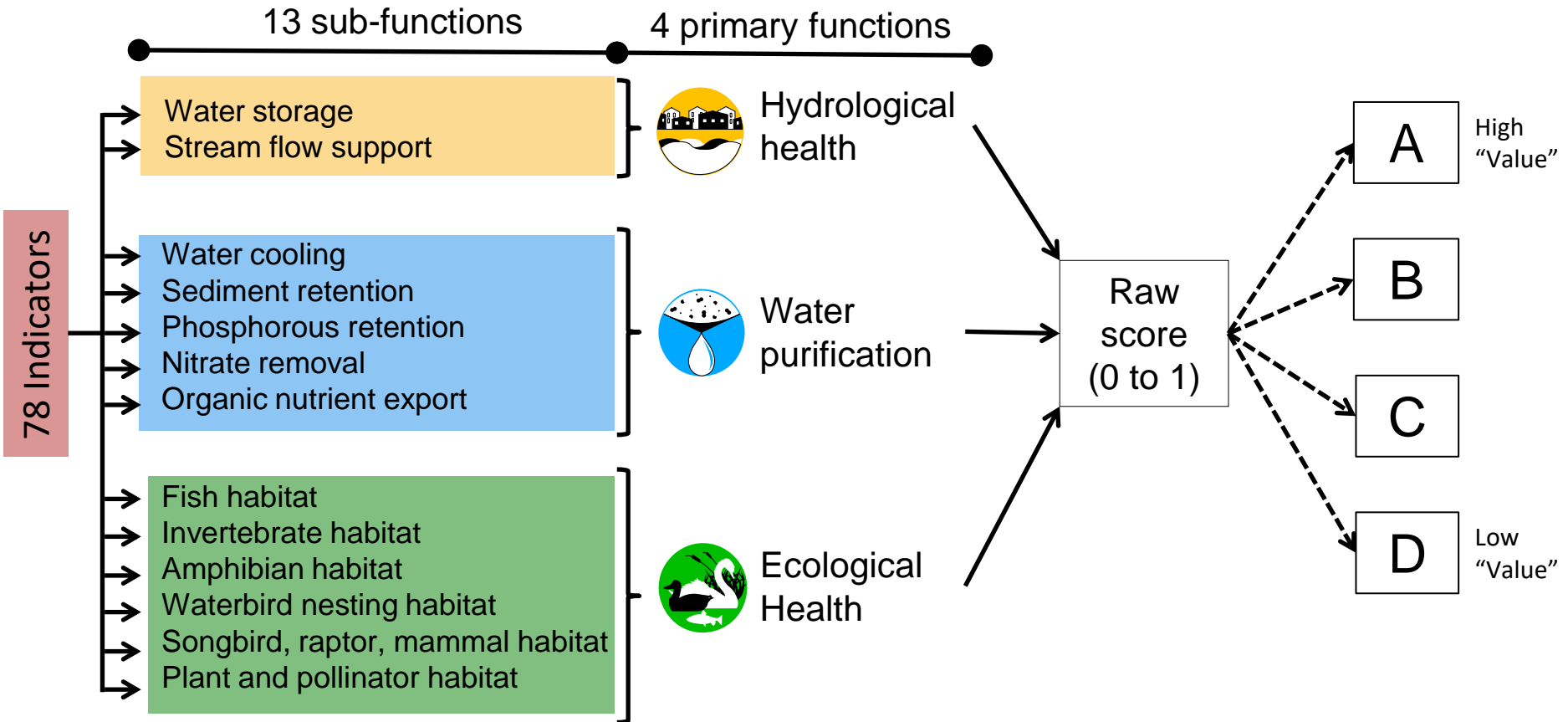
Mitigation Hierarchy:



- Avoidance and minimization are meant to be the *primary strategies* for managing impacts
- Where impacts to wetlands can not be avoided or minimized, loss must be compensated through habitat replacement

Alberta Wetland Policy (2013)

- Function-based policy (A, B, C, D value wetlands)

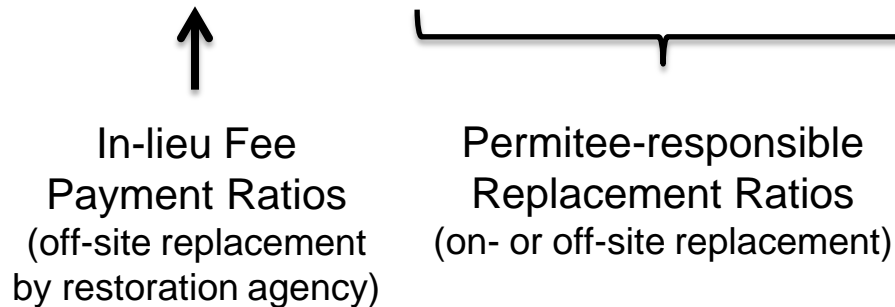


Wetland Replacement Ratios

- Higher “value” wetlands require a greater “replacement” ratio
- Wetlands are scored and compensation rates are calculated within a “Relative Wetland Value Assessment Unit” (RWVAU)

The Wetland Replacement Matrix

		Value of Replacement Wetland			
		D	C	B	A
Value of Lost Wetland	A	8:1	4:1	2:1	1:1
	B	4:1	2:1	1:1	0.5:1
	C	2:1	1:1	0.5:1	0.25:1
	D	1:1	0.5:1	0.25:1	0.125:1



In-lieu Fee Payment Ratios
 (off-site replacement by restoration agency)

Permittee-responsible Replacement Ratios
 (on- or off-site replacement)

*Ratios are expressed as hectares of wetlands

We need *access* to more restoration sites ...



We need *access* to more restoration sites ...

- Most drained wetlands are on private land
- Many land owners are not interested in restoring wetlands
- Private versus public benefits
 - Nuisance and opportunity costs are high for land owners
 - Benefits accrue to the public at larger spatial scales
- Past government policies have cultivated negative social attitudes that discourage restoration

Can we create an incentive to restore wetlands?





ALBERTA'S
LIVING LABORATORY
PROJECT

Restoring our wetlands together

Your Participation Pays

Rocky View County landowners have a unique opportunity to restore former wetlands—and get paid for it.

Wetlands & Ecosystem Services

How do you target a limited restoration budget?

How much does it cost to restore on private land?

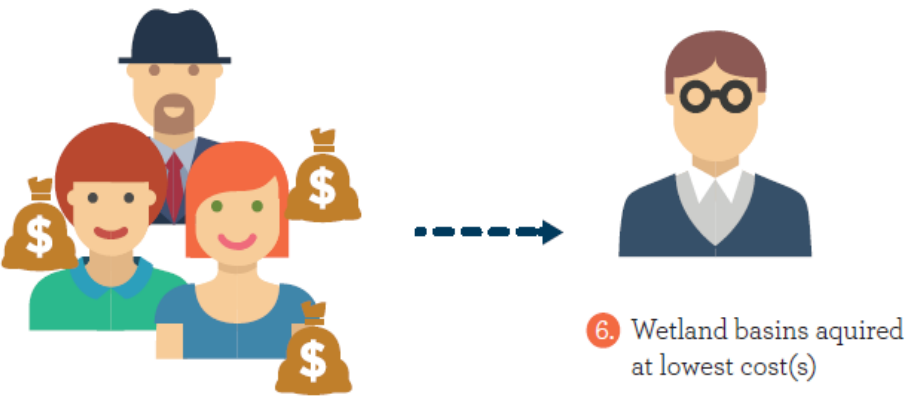


What is a Reverse Auction?

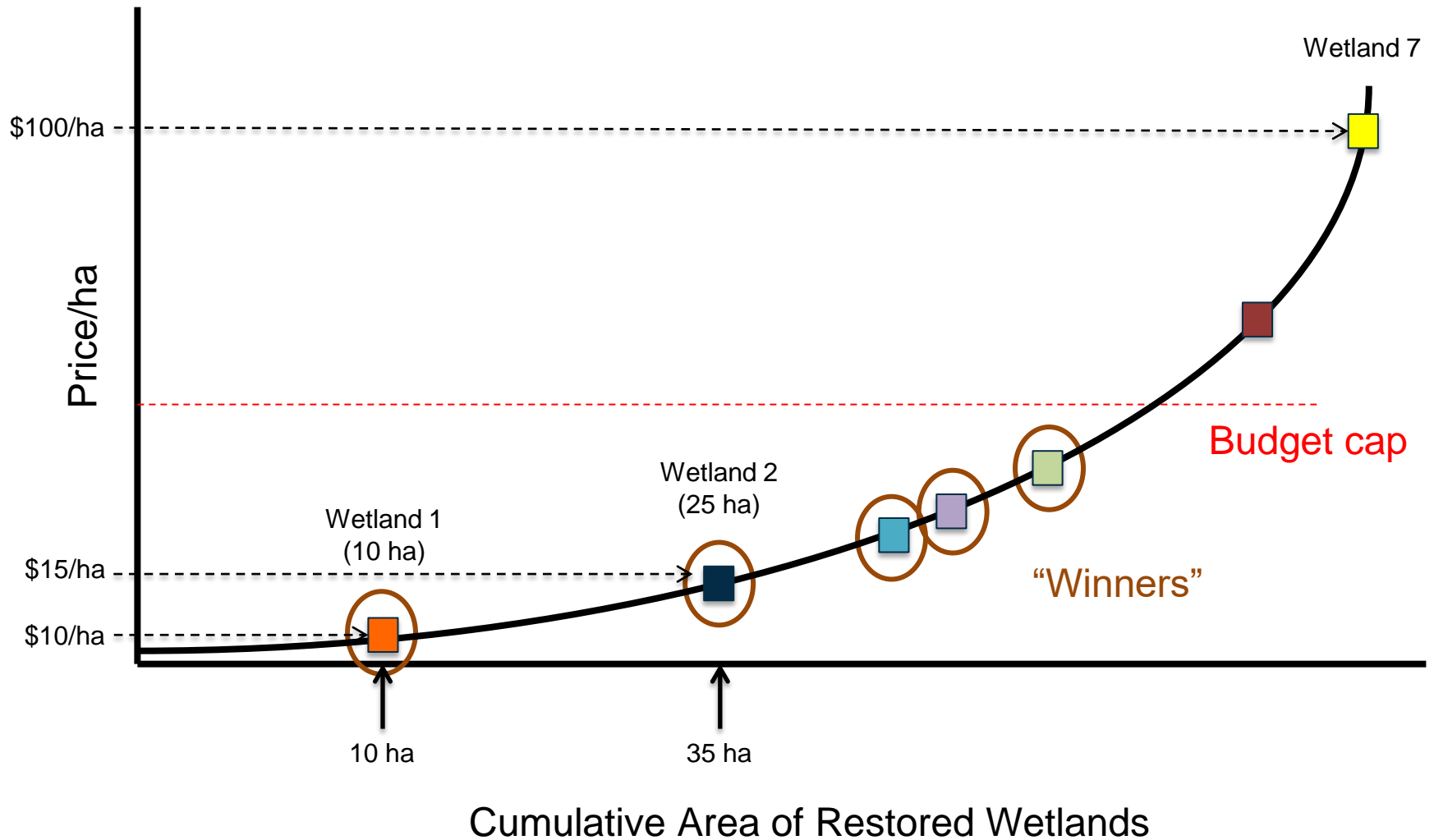


3. Offers compared and selected based on environmental service dimension until budget is exhausted

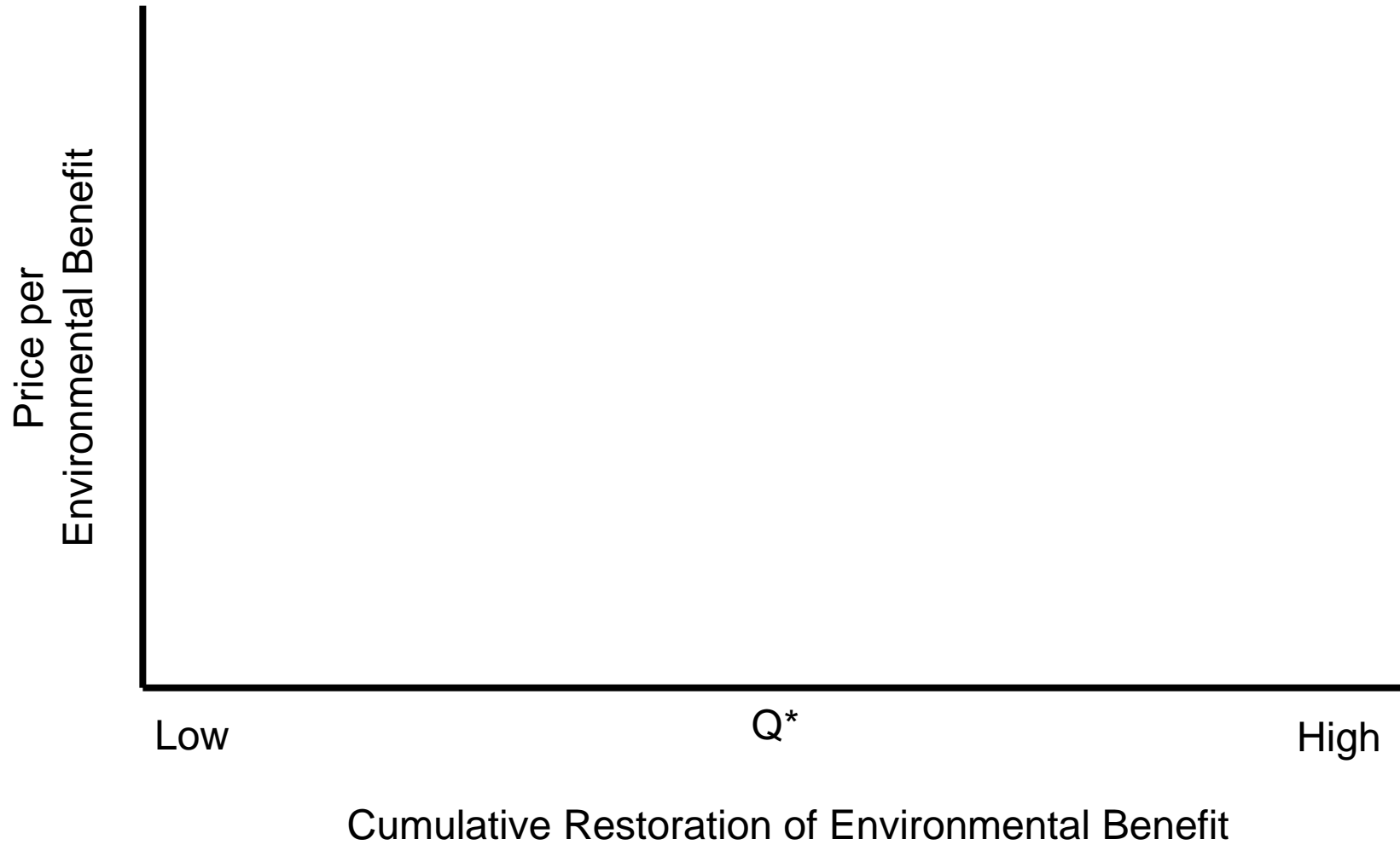
4. Cheapest offers selected



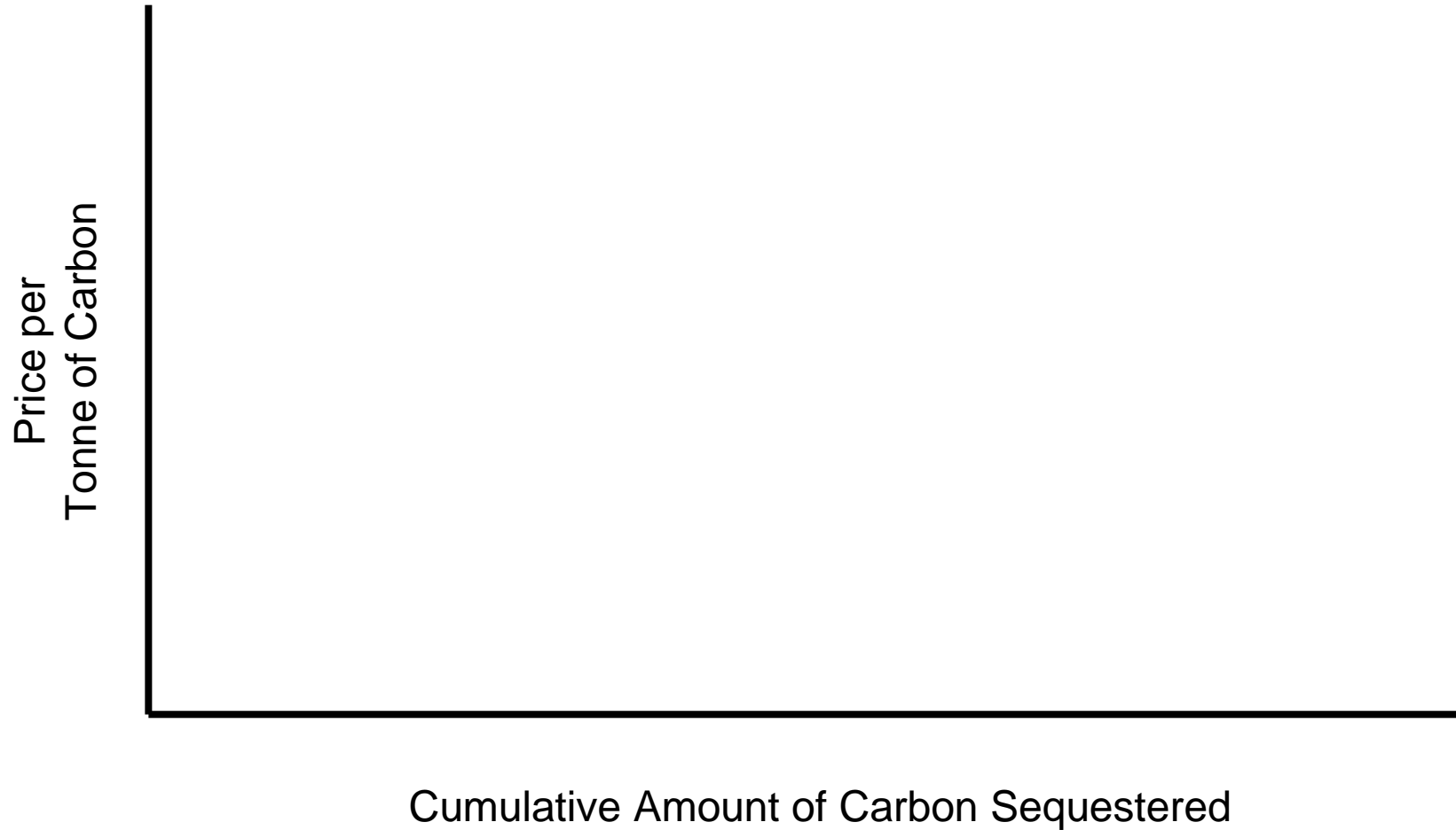
Bid Ranking - Area



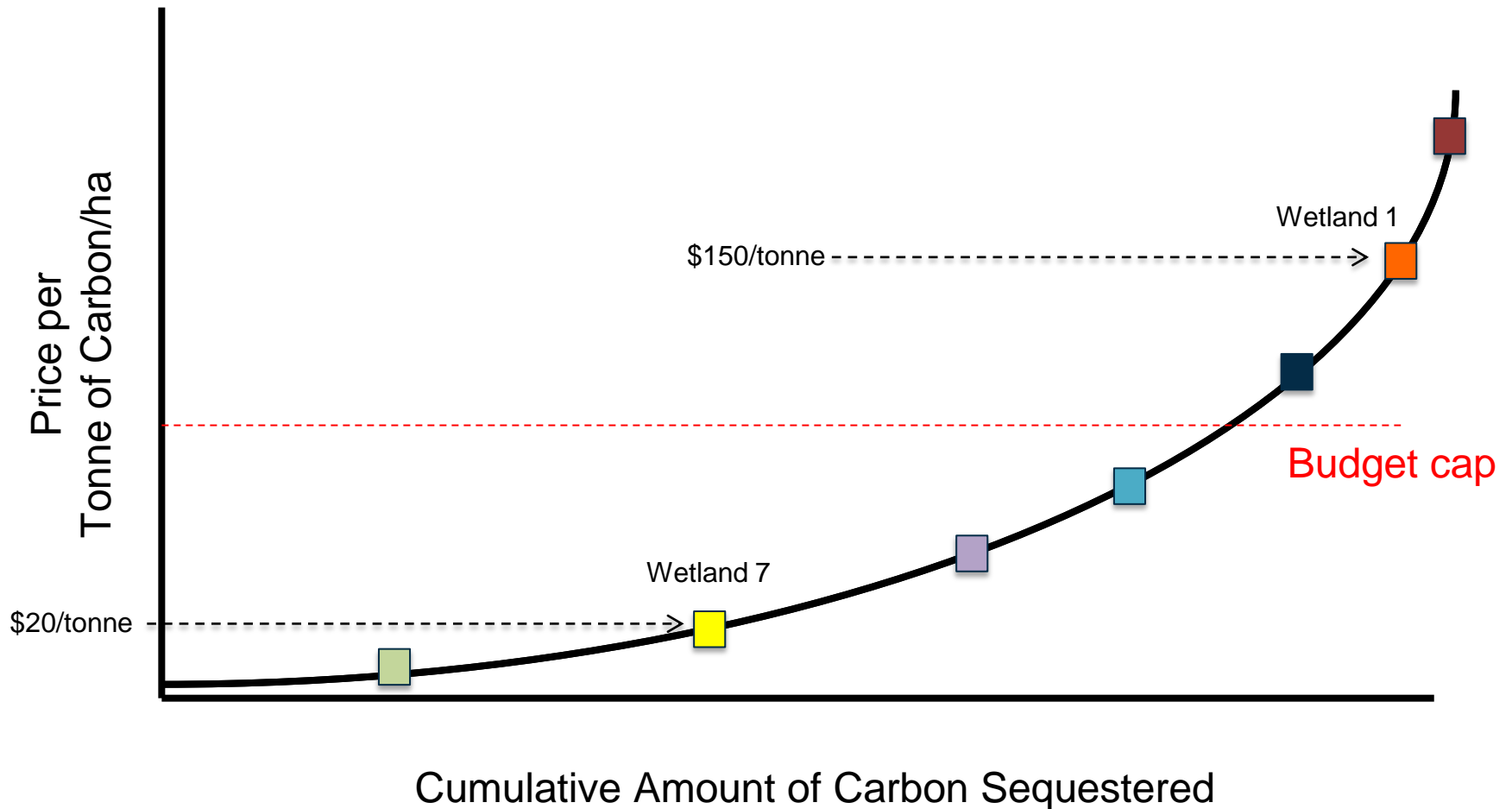
Bid Ranking – Environmental Benefit



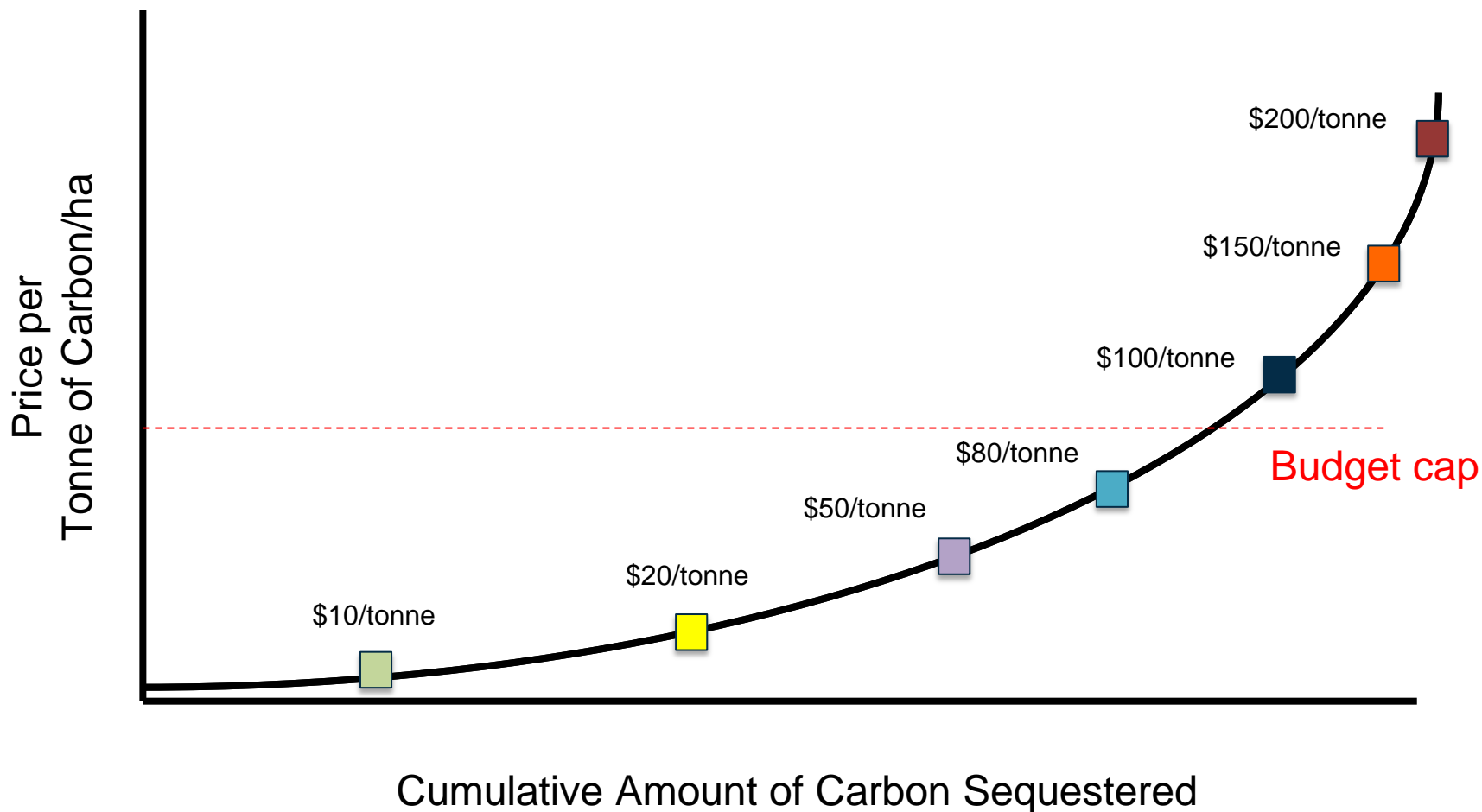
Bid Ranking – Environmental Benefit



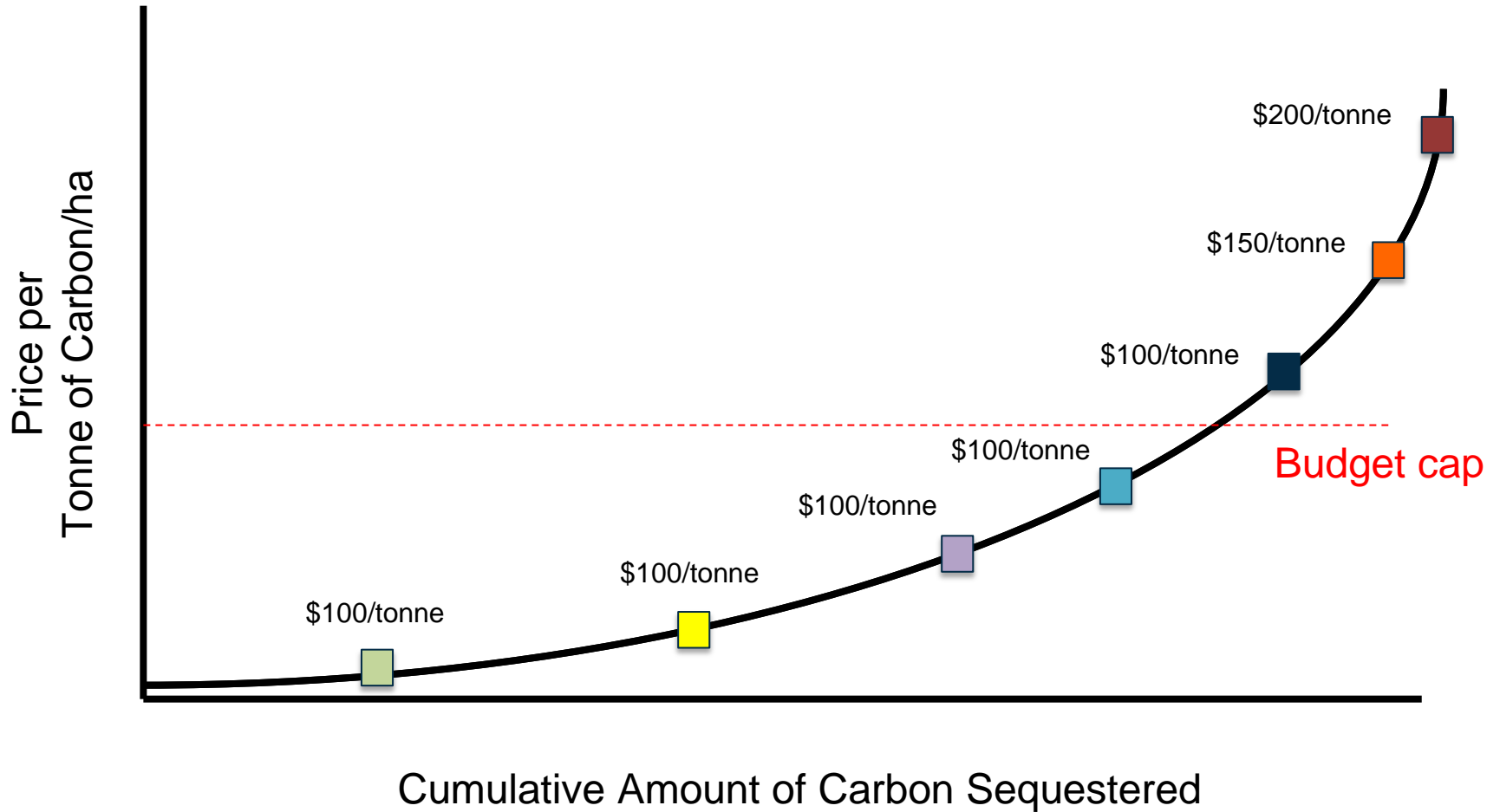
Bid Ranking – Environmental Benefit



Discriminate Price Auction



Uniform Price Auction



Where are we working?



Nose Creek
Watershed

Rocky View
County

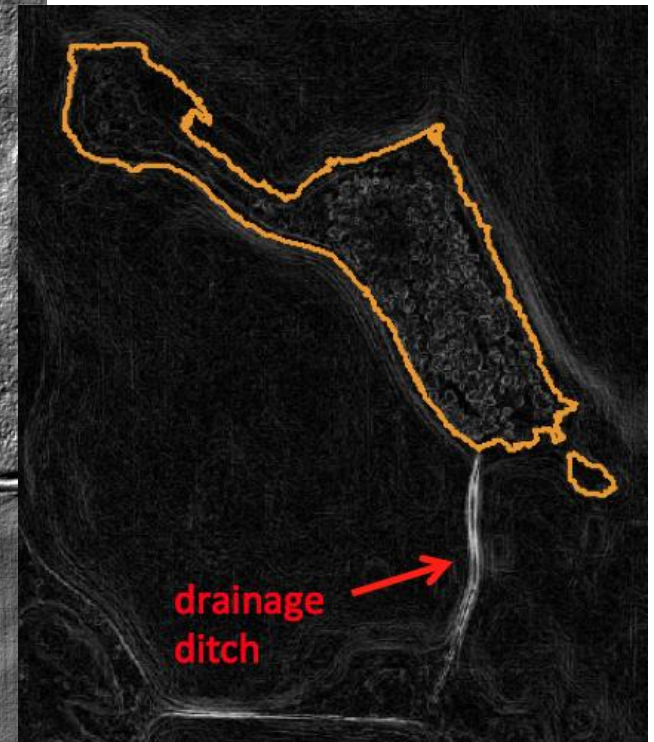
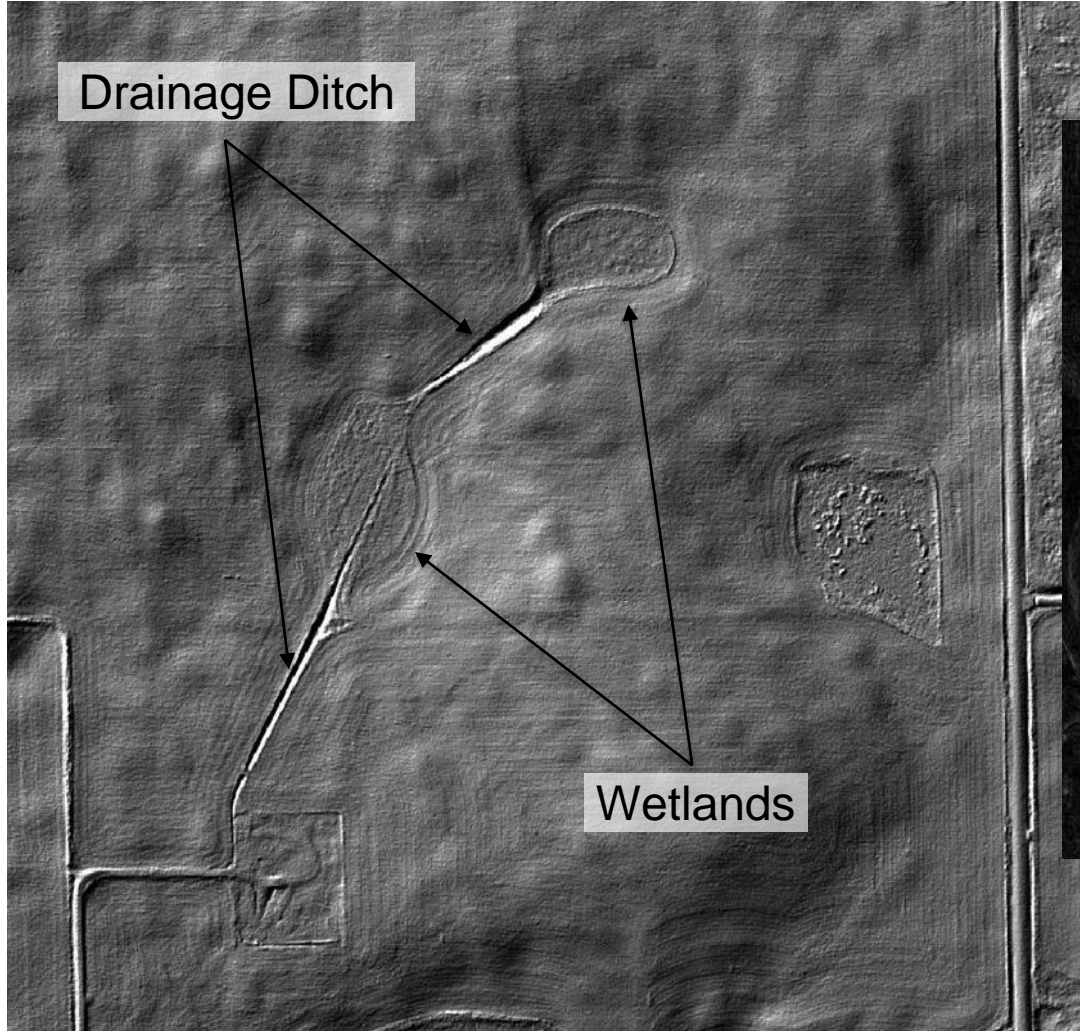
Calgary

Nose Creek watershed

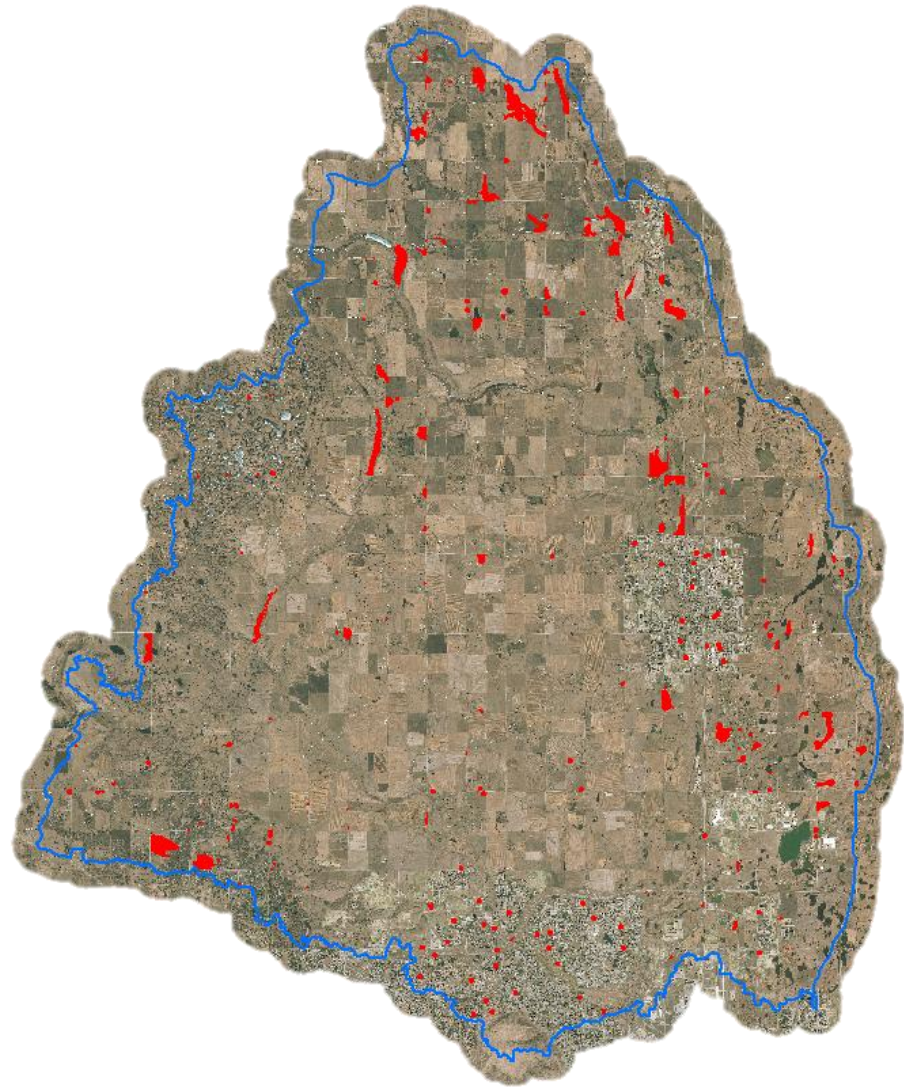


How are we doing this?

STEP 1: Locate drained wetlands



STEP 1: Locate Drained Wetlands



Estimated # of wetlands with drainage ditches: **444**

Estimated # of landowners with wetlands with drainage ditches: **255**

Average size of wetland with drainage ditch: **3.8 ha**

STEP 2: Recruit landowners with drained wetlands



ALBERTA'S
LIVING LABORATORY
PROJECT

**Landowners
bring this
project to life.**

www.restoreourwetlands.ca

A close-up photograph of a frog with brown and white markings, perched on a log. The image is partially obscured by a dark blue shape at the top and a yellow wavy graphic at the bottom.



ALBERTA'S
LIVING LABORATORY
PROJECT

**Living
laboratories
need leaders.**

www.restoreourwetlands.ca

A photograph of a bird with long, thin beak and brown and white feathers, standing in tall green grasses. The image is partially obscured by a dark blue shape at the top and a yellow wavy graphic at the bottom.



ALBERTA'S
LIVING LABORATORY
PROJECT

**Your
participation
pays.**

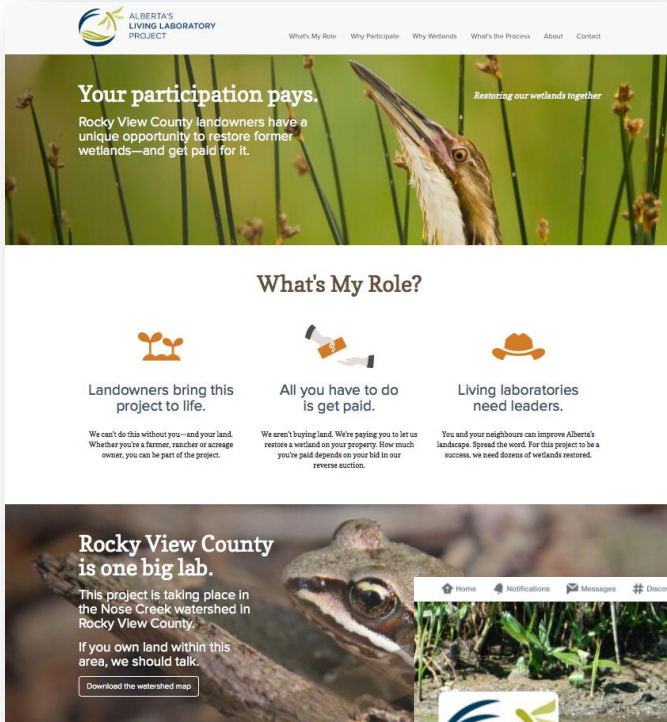
www.restoreourwetlands.ca

A photograph of a mallard duck swimming in water, with its reflection visible below. The image is partially obscured by a dark blue shape at the top and a yellow wavy graphic at the bottom. The bottom of the flyer features a repeating pattern of the project's logo.

STEP 2: Recruit landowners with drained wetlands

Website (www.restoreourwetlands.ca)

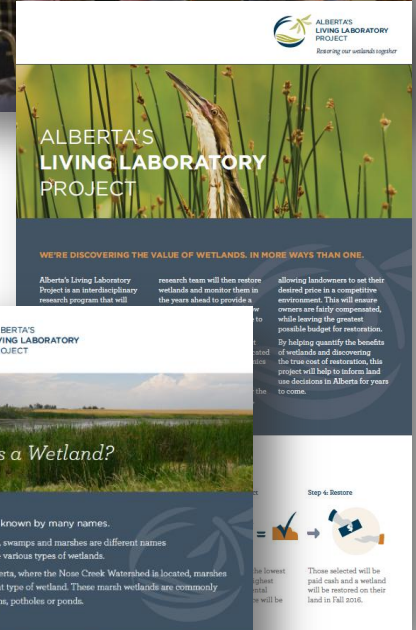
Workshops



The website homepage features a navigation bar with links: 'What's My Role', 'Why Participate', 'Why Wetlands', 'What's the Process', 'About', and 'Contact'. The main heading is 'Your participation pays.' with a sub-headline 'Restoring our wetlands together'. Below this, a paragraph states: 'Rocky View County landowners have a unique opportunity to restore former wetlands—and get paid for it.' A central section titled 'What's My Role?' is divided into three columns: 1. 'Landowners bring this project to life.' with a plant icon and text: 'We can't do this without you—and your land. Whether you're a farmer, rancher or acreage owner, you can be part of the project.' 2. 'All you have to do is get paid.' with a checkmark icon and text: 'We aren't bringing land. We're paying you to let us restore a wetland on your property. How much you're paid depends on your bid in our reverse auction.' 3. 'Living laboratories need leaders.' with a hat icon and text: 'You and your neighbors can improve Alberta's landscape. Spread the word! For this project to be a success, we need dozens of wetlands restored.' A bottom section titled 'Rocky View County is one big lab.' includes a frog image and text: 'This project is taking place in the Nose Creek watershed in Rocky View County. If you own land within this area, we should talk.' A button says 'Download the watershed map.'



Print Materials & Advertising



This section displays various print materials and advertising. At the top right is the Alberta Living Laboratory Project logo. Below it is a large image of a bird in a wetland with the text 'ALBERTA'S LIVING LABORATORY PROJECT'. A central banner reads 'WE'RE DISCOVERING THE VALUE OF WETLANDS, IN MORE WAYS THAN ONE.' Below this are three columns of text: 1. 'Alberta's Living Laboratory Project is an interdisciplinary research program that will...' 2. '...research team will then restore wetlands and monitor them in the years ahead to provide a...' 3. '...allowing landowners to set their desired price in a competitive environment. This will ensure owners are fairly compensated, while leaving the greatest possible budget for restoration.' Below this is a section titled 'What is a Wetland?' with a large image of a wetland and text: 'Wetlands are known by many names. Boys, peatlands, swamps and marshes are different names used to describe various types of wetlands. In southern Alberta, where the Nose Creek Watershed is located, marshes are the dominant type of wetland. These marsh wetlands are commonly known as sloughs, potholes or ponds.' To the right is a 'Step 4: Restore' diagram showing a flow from a wetland to a restored wetland. Below this is a text box: 'The lowest bid will be paid cash and a wetland will be restored on their land in Fall 2016.'

Social Media (@cashforwetlands)



A screenshot of the Twitter profile for 'Alberta's Living Lab' (@cashforwetlands). The profile shows 8 tweets, 43 following, and 13 followers. Recent tweets include: 1. 'Your participation pays! Alberta's Living Laboratory Project wants to pay you to restore your drained wetlands.' 2. 'Did you know? Wetlands store water in times of drought? "Warm, dry winter could mean tough year for Alberta farmers" wtrpr/1xX3hE' 3. 'Our project website has officially launched! Check it out: restoreourwetlands.ca #wetlands #restoration #Alberta' 4. 'Alberta moves to increase watershed health and resiliency to droughts and floods #water #ablog #cdnrpoli.alberta.ca/release.cfm?x1...'



A print material titled 'Wetlands aren't always wet—and that makes them special.' It features a large image of a wetland and text: 'While water is an important part of a wetland, you might not see water in a wetland all of the time. But if you dig down, you'll find that the soils underneath are spongy. These wetland soils tend to be saturated with water throughout the three wetlands in the spring to feed and wet as they recharge water. Other wetlands hold water permanently and only dry up under extreme drought conditions. These wetlands provide important year-round habitat for wildlife, such as frogs, songbirds and insects. In some wetlands, you can even see wildflowers and other types of habitat. In fact, many plant and animal species can only flourish in wetlands, making wetlands incredibly important for supporting a diversity of species.'

STEP 2: Recruit Landowners with Drained Wetlands

Targeted Recruitment

- Information mail out to 255 landowners
- Phone calls to 125 landowners
- First information session: 12 participants
- Targeted follow-up calls: 80 landowners with 94 drained wetlands
- Mail out to 80 landowners: included invitation to second information session and maps showing drained wetlands



STEP 2: Recruit Landowners with Drained Wetlands

Landowner Responses:

- A small number of landowners declined to participate on first contact
- Many landowners declined to participate after several conversations and after having reviewed information brochures and maps
- Reason given for not participating include:
 - Not interested
 - Land is rented and too complicated with multiple renters
 - Landowner feels that the site is unsuitable for restoration



STEP 3: Pay for access to drained wetlands

Step 1: Bid



Step 2: Compare



Step 3: Select



Step 4: Restore



Reverse Auction Results – Participation

- 5 landowners initially expressed interest, but one dropped out after wetland site visit
- Received 4 bids that included 14 wetlands, totalling 12.6 ha
- Bid prices ranged between \$0 and \$13,861/ha
- A uniform price auction was used, so all landowners received the same price/ha



Reverse Auction – Contract Terms

- Contracts administered by Ducks Unlimited Canada
- 10 year lease agreement
- The restored wetland stays under the management of the landowner
- There is no restriction on haying or grazing the wetland
- No breaking or draining the wetland is allowed
- Landowner may use the water from the wetland for household and/or livestock use



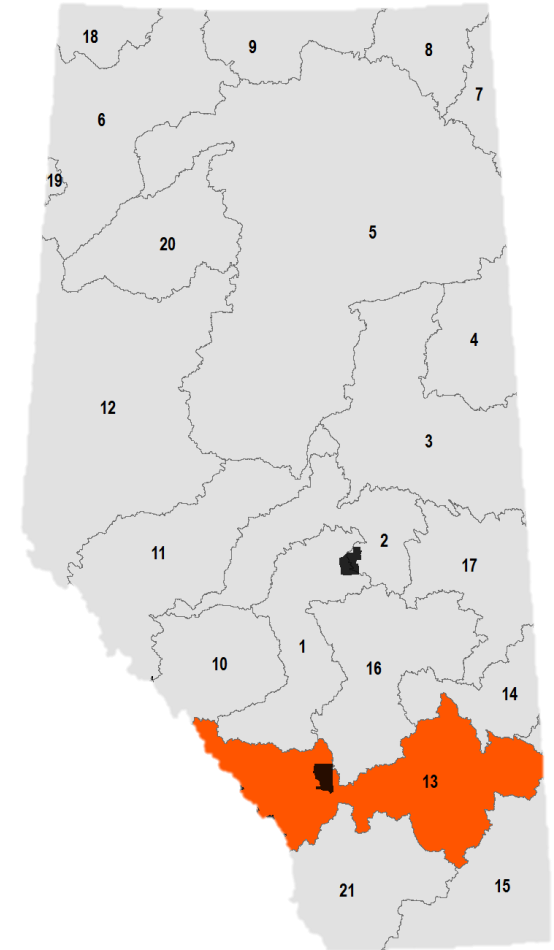
Reverse Auction Results – Preliminary Costs

	Price Per Hectare (CAN\$)
Uniform Cost (Landowner Payment)	\$13,861.00
Estimated Restoration Costs	\$2,660.00
Estimated Transaction Costs	\$6,000.00
Estimated Monitoring Costs	\$800.00
Total Cost for Wetland Restoration	\$23,321.00



Wetland Replacement In-Lieu Fee Rates (July 2016)

Land Ownership	Relative Wetland Value Assessment Unit	<i>In lieu</i> Rate (\$/ha)
Public Lands	All units, province-wide	10,300
Private Lands	1	19,100
	2	19,400
	3	19,100
	4	19,100
	5	18,400
	6	18,200
	7	18,400
	8	18,400
	9	18,400
	10	19,100
	11	19,400
	12	18,500
	13	17,700
	14	18,200
	15	17,300
	16	18,500
	17	18,600
	18	18,200
	19	18,200
	20	18,200
	21	17,700



Scenario Analysis – Ecosystem Services

- For all drained wetlands estimate the **potential *restored* function** of:
 - Flood abatement
 - Nutrient removal
 - Carbon sequestration
 - Plant Biodiversity
- Compare wetland ranking within each scenario
- Examine how targeting would change based on the ecosystem service (or bundle of services) selected



STEP 4: Monitor ecosystem functional recovery



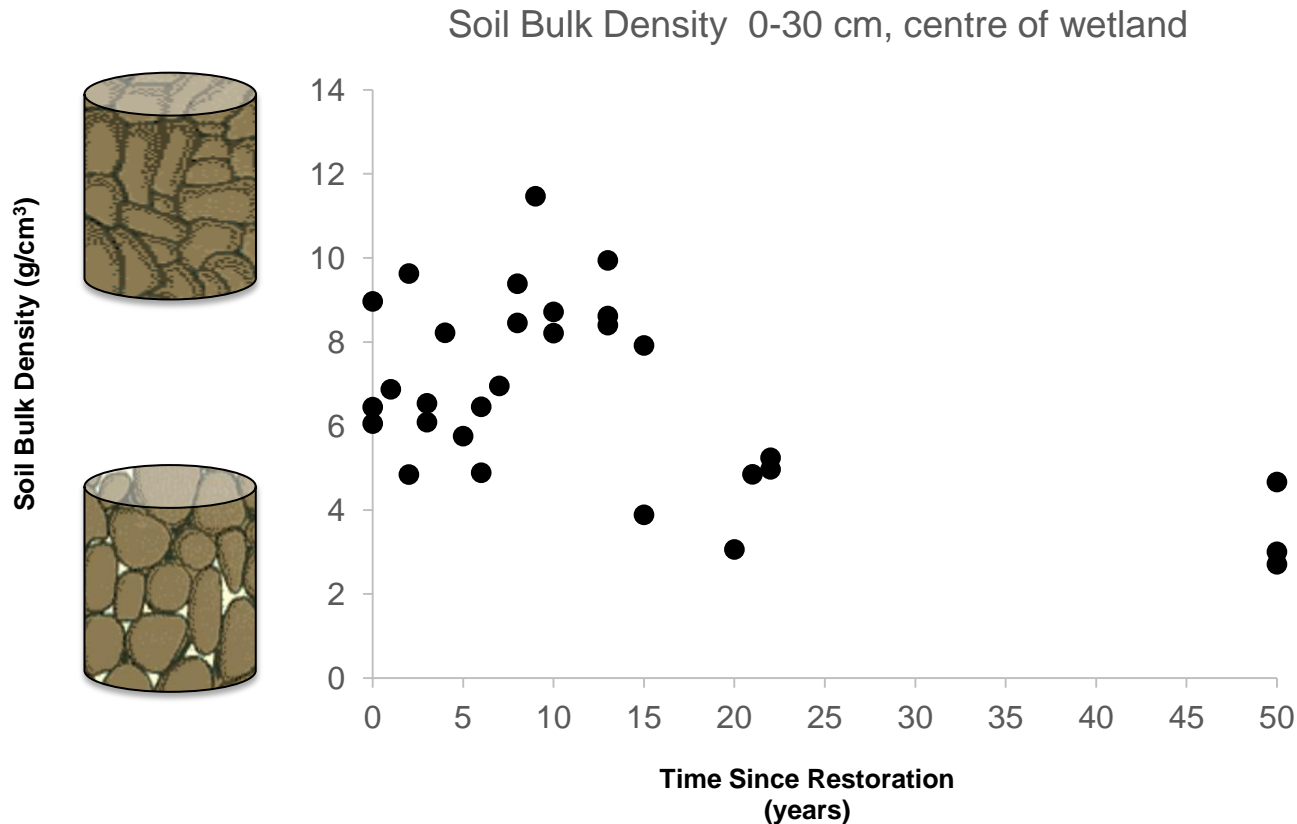
Wetland Restoration & Recovery of Ecosystem Services

- What is the “*rate of recovery*” and “*yield*” of restored functions & services?



Functional Recovery Example

- Older restored wetlands have lower soil bulk density (higher soil porosity)
- Allows for higher infiltration and storage of water → increased flood mitigation



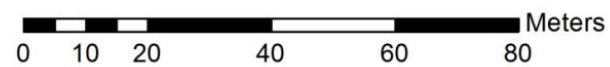
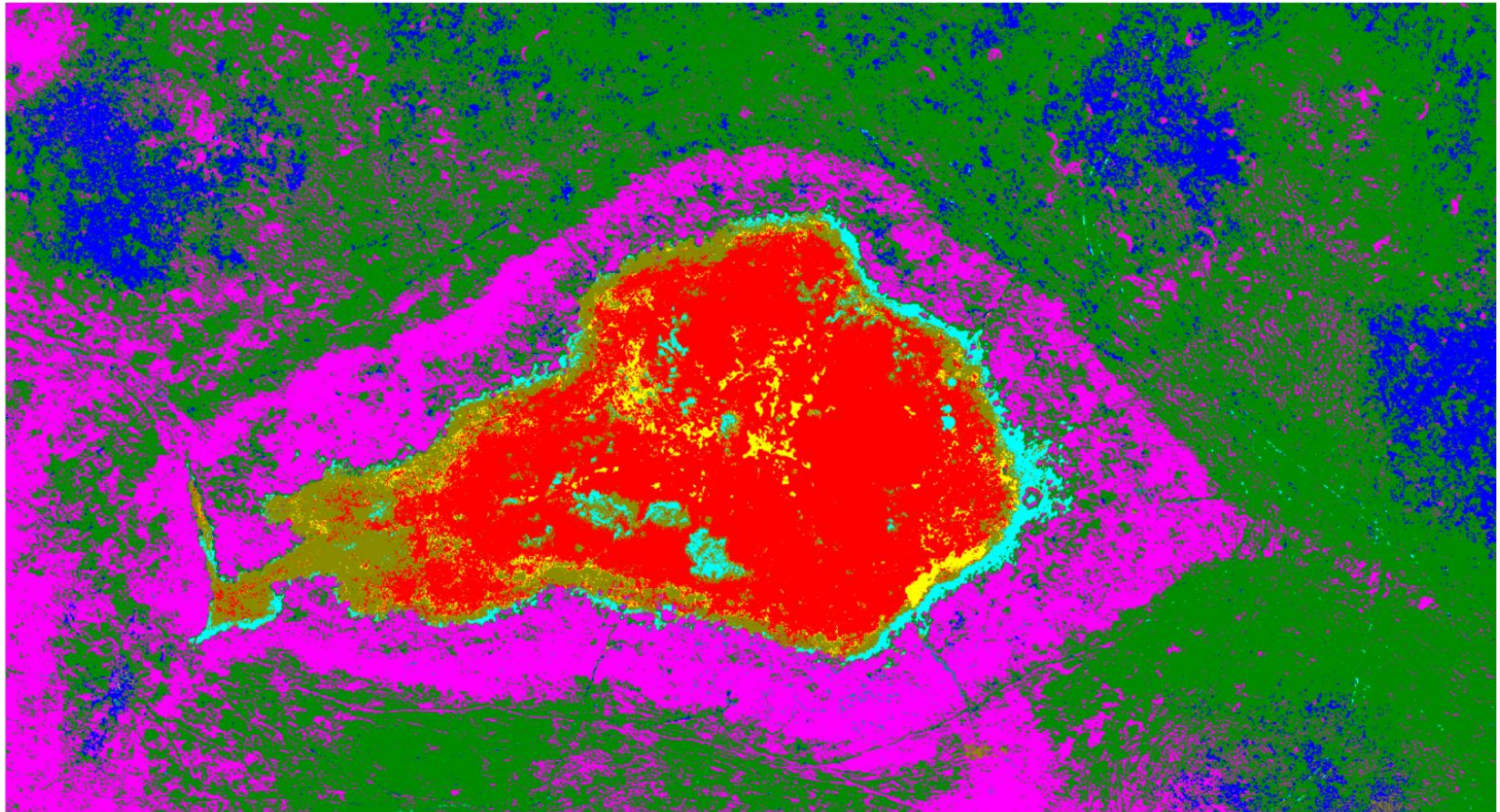
Methods for Monitoring Ecosystem Recovery

What is the efficacy of using Unmanned Aerial Vehicles (UAVs) to monitor ecosystem functional recovery in restored wetlands?

- Can remote sensing augment or replace field-based surveys?
- What are the logistical constraints of using UAVs?
- What information can we get from UAVs that we can't get from other remote sensing platforms?



Wetland Zonation & Dominant Cover Types



Wetland Monitoring with UAVs

- Initial results are promising, but more work must be done to develop robust and reliable methods
- Calibration of UAV sensors may be a critical component of data quality



What Have We Learned?

- Conservation versus restoration – there are different challenges
- Multiple levels of government are involved in regulation, which creates barriers to implementation
- Access to and communication with landowners is difficult without dedicated staff
- Negative social attitudes about wetlands are difficult to overcome
- In-lieu fee payment rates are too low to cover costs associated with paying for access to private lands



Project Funding



Project Partners



Project Website:
www.restoreourwetlands.ca



Wetland Restoration

- Ducks Unlimited Canada is the only organization authorized by the government to restore wetlands
- This project targeted wetlands with drainage ditches
- Natural hydrology is restored by placing an earthen plug into the ditch
- No other habitat restoration is completed



Research Sites

- Eight wetlands were sampled in July, August, & September 2016
- Wetlands differed in size, class, and time since restoration
- Imagery was collected using a Draganfly X4-P quadcopter instrumented with an RGB and 5-band multispectral camera



Vegetation Sampling

- Permanent plots were established and sampled on the ground by a botanist, while simultaneously being flown by the UAV
- Plots were selected to be representative of common species and land cover types in the wetlands
- Vegetation cover within each 1m² quadrant was identified and % cover was estimated

